CLAIMS

1. An electrochemical cell comprising:

(a) a cathode comprising an electroactive sulfur-containing material;

(b) an anode comprising lithium; and

(c) a nonaqueous electrolyte, wherein the electrolyte comprises:

(i) one or more nonaqueous solvents selected from the group consisting of acyclic ethers, cyclic ethers, polyethers, and sulfones;

(ii) one or more lithium salts; and

(iii) one or more N-O additives.

2. The cell of claim 1 wherein the one or more N-O additives is selected from one or more of the group consisting of inorganic nitrates, organic nitrates, inorganic nitrites, and organic nitro compounds.

3. The cell of claim 2 wherein the inorganic nitrate is selected from one or more of the group consisting of lithium nitrate, potassium nitrate, cesium nitrate, barium nitrate, and ammonium nitrate.

4. The cell of claim 2 wherein the inorganic nitrite is selected from one or more of the group consisting of lithium nitrite, potassium nitrite, cesium nitrite, and ammonium nitrite.

5. The cell of claim 2 wherein the organic nitro compound is selected from one or more of the group consisting of nitromethane, nitropropane, nitrobenzene, dinitrobenzene, nitrotoluene, dinitrotoluene, and nitropyridine.

6. The cell of claim 1 wherein the one or more lithium salts is selected from one or more of the group consisting of LiSCN, $LiCF_3SO_3$, and $LiN(CF_3SO_2)_2$.

7. The cell of claim 1 wherein the one or more lithium salts consist of LiSCN and $LiN(CF_3SO_2)_2$ and the N-O additive comprises lithium nitrate.

8. The cell of claim 1 wherein the concentration of the one or more N-O additives in the electrolyte is from about 0.02 m to 2.0 m.

9. The cell of claim 1 wherein the concentration of the one or more N-O additives in the electrolyte is from about 0.1 m to 1.5 m.

10. The cell of claim 1 wherein the concentration of the one or more N-O additives in the electrolyte is from about 0.2 m to 1.0 m.

11. The cell of claim 1 wherein the concentration of the one or more lithium salts in the electrolyte is from about 0.2 m to about 2.0 m.

12. The cell of claim 1 wherein the acyclic ether is selected from one or more of the group consisting of dimethoxymethane, trimethoxymethane, dimethoxyethane, diethoxyethane, and 1,3-dimethoxypropane.

13. The cell of claim 1 wherein the cyclic ether is selected from one or more of the group consisting of tetrahydrofuran, 2-methyl tetrahydrofuran, tetrahydropyran, 1,3-dioxolane, 1,3-dioxane, and 1,4-dioxane.

14. The cell of claim 1 wherein the polyether is selected from one or more of the group consisting of diethylene glycol dimethyl ether, triethylene glycol dimethyl ether, tetraethylene glycol dimethyl ether, and dipropylene glycol dimethyl ether.

15. The cell of claim 1 wherein the sulfone is selected from one or more of the group consisting of sulfolane, 3-methyl sulfolane, and 3-sulfolene.

16. The cell of claim 1 wherein the electroactive sulfur-containing material comprises greater than 75 % by weight of sulfur.

17. The cell of claim 1 wherein the electroactive sulfur-containing material comprises elemental sulfur.

18. The cell of claim 1 wherein the anode comprises lithium metal.

19. The cell of claim 1 that further includes a separator disposed between the anode and the cathode.

20. A battery comprising a casing and one or more cells of claim 1.

21. The cell of claim 1 wherein the one or more N-O additives is lithium nitrate.

22. The cell of claim 1 wherein the nonaqueous solvent comprises dioxolane.

23. The cell of claim 1 wherein the one or more solvents consists of dimethoxyethane and dioxolane.

24. The cell of claim 19 wherein the one or more N-O additives was included as part of the separator and was introduced into the electrolyte after the electrolyte came into contact with the separator.

25. The cell of claim 1 wherein the one or more N-O additives was included as part of the cathode and was introduced into the electrolyte after the electrolyte came into contact with the cathode.

26. An electrochemical cell comprising:

(a) a cathode comprising an electroactive sulfur-containing material;

(b) an anode comprising lithium; and

(c) a nonaqueous electrolyte, wherein the electrolyte comprises:

(i) one or more nonaqueous solvents selected from the group consisting of acyclic ethers, cyclic ethers, polyethers, and sulfones; and

(ii) one or more N-O additives.

27. The cell of claim 26 wherein the one or more N-O additives is selected from one or more of the group consisting of inorganic nitrates, organic nitrates, and inorganic nitrites.

28. The cell of claim 27 wherein the inorganic nitrate is selected from one or more of the group consisting of lithium nitrate, potassium nitrate, cesium nitrate, barium nitrate, and ammonium nitrate.

29. The cell of claim 27 wherein the inorganic nitrite is selected from one or more of the group consisting of lithium nitrite, potassium nitrite, cesium nitrite, and ammonium nitrite.

30. The cell of claim 26 wherein the concentration of the one or more N-O additives in the electrolyte is from about 0.2 m to 2.0 m.

31. The cell of claim 26 wherein the electrolyte further comprises one or more lithium salts selected from one or more of the group consisting of LiSCN, $LiCF_3SO_3$, and $LiN(CF_3SO_2)_2$.

32. The cell of claim 26 that further includes a separator disposed between the anode and the cathode.

33. The cell of claim 32 wherein the one or more N-O additives was included as part of the separator and introduced into the electrolyte after the electrolyte came into contact with the separator.

34. The cell of claim 26 wherein the one or more N-O additives was included as part of the cathode and introduced into the electrolyte after the electrolyte came into contact with the cathode.

35. A battery comprising a casing and one or more cells of claim 26.